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This publication provides current information concerning Kentucky's economy, its business activities and related public policy issues. It is intended to serve as a forum for the publication of short expository articles as well as analytical articles addressing any of these areas. The publication also includes tables of selected data chosen as indicators of developments in Kentucky and the national economies. Sometimes information about enhancements to the Kentucky Economic Information System (KEIS) also appears in this publication.

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Economic Commentary

Charles F. Haywood

November, 1989, marked the end of the seventh year of sustained expansion in the U. S. economy. During this same period, the Kentucky economy has also shown good expansion, though sometimes lagging slightly behind national trends. To illustrate the relationship between Kentucky and U. S. trends during the sustained economic expansion, movements in nonagricultural payroll employment, i.e, the number of nonagricultural "wage and salary" workers, since November, 1982, are compared.

Table 1 shows seasonally-adjusted monthly data for nonagricultural payroll employment in Kentucky for the period from November, 1982, through August, 1989.[1] Table 2 shows comparable data for the United States. The data in both tables indicate relatively significant gains in employment. In Kentucky, the expansion was from a level of 1,156,000 in November, 1982, to 1,403,000 in August, 1989--a relative gain of 21.4 percent. In the U. S., the increase was from 88,755,000 in November, 1982, to 108,901,000 in August, 1989--a relative gain of 22.7 percent.

Comparison of the trends of nonagricultural payroll employment in Kentucky and the U. S. is somewhat facilitated by indexing the widely differing employment magnitudes. With employment in November, 1982, taken as the base (i.e., November, 1982 = 100), the nonagricultural employment data were indexed for both Kentucky and the U. S. The two indexes are compared graphically in Figure 1.

As indicated in Figure 1, the Kentucky economy lagged behind the U. S. economy

Table 1
Kentucky Nonagricultural Payroll Employment
(thousands)

	1982	1983	1984	1985	1986	1987	1988	1989
January		1,148	1,189	1,236	1,262	1,302	1,360	1,394
February		1,145	1,194	1,232	1,265	1,301	1,361	1,397
March		1,146	1,194	1,242	1,266	1,304	1,365	1,394
April		1,142	1,199	1,245	1,270	1,315	1,361	1,387
May		1,145	1,203	1,249	1,271	1,321	1,362	1,386
June		1,151	1,212	1,251	1,270	1,325	1,367	1,390
July		1,133	1,221	1,249	1,273	1,378	1,378	1,407
August		1,139	1,223	1,254	1,278	1,337	1,375	1,403
September		1,167	1,229	1,260	1,280	1,340	1,372	
October		1,165	1,233	1,259	1,283	1,347	1,375	
November	1,156	1,172	1,234	1,263	1,284	1,353	1,389	
December	1,150	1,178	1,235	1,263	1,288	1,358	1,379	

Source: Kentucky Cabinet for Human Resources through Kentucky Economic Information System

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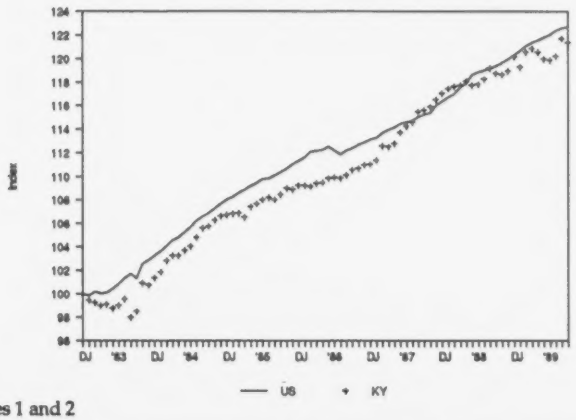
Table 2
U.S. Nonagricultural Payroll Employment
(thousands)

	1982	1983	1984	1985	1986	1987	1988	1989
January		88,947	92,391	96,419	99,496	100,919	103,827	107,442
February		88,806	92,846	96,591	99,543	101,150	104,365	107,711
March		88,875	93,058	96,910	99,659	101,329	104,661	107,888
April		89,148	93,456	97,119	99,912	101,598	105,281	108,101
May		89,522	93,843	97,442	99,617	101,708	105,489	108,310
June		89,927	94,317	97,473	99,323	101,818	105,644	108,607
July		90,274	94,615	97,707	99,601	102,126	105,799	108,791
August		89,918	94,893	97,977	99,772	102,275	105,954	108,901
September		91,018	95,238	98,217	100,039	102,434	102,207	
October		91,345	95,573	98,559	100,209	102,983	106,475	
November	88,755	91,688	95,882	98,801	100,415	103,285	106,824	
December	88,635	92,026	96,092	99,086	100,567	103,612	107,097	

Source: U.S. Bureau of Labor Statistics through Kentucky Economic Information System

Figure 1
Nonagaricultural Employment Trends
U.S. and KY Indexes, 11/82 = 100



Source: Derived from Tables 1 and 2

in pulling out of the 1981-1982 recession. Although not making the "quick start" the U. S. did in 1983, the Kentucky economy expanded at a slightly faster pace than the U.S. during the first half of 1984 and came close to catching up. The gap between the Kentucky and U. S. indexes narrowed to about one percentage point in the third quarter of 1984.

In the fourth quarter of 1984, however, the Kentucky economy began again to lag behind the U. S., and the lagging continued through 1985. The gap between the two employment indexes widened to 2.9 percentage points by January, 1986.

Expansion of the Kentucky economy then entered a period of acceleration, running from the early months of 1986 through the end of 1987. Employment growth in Kentucky caught up with the U. S. trend and briefly surged ahead during the latter half of 1987. In December, 1987, the Ken-

tucky index hit 117.5, eight-tenths of a percentage point above the U. S. index at 116.7. The acceleration of growth in Kentucky during 1986-1987 is readily apparent in Figure 2. The negative gap between the Kentucky and U. S. indexes begins to diminish in early 1986, and a positive gap emerges in the latter half of 1987.

Since the end of 1987, the Kentucky economy has again been lagging behind the national economy. Also, employment in Kentucky has shown greater volatility. During the first eight months of 1989, the Kentucky index fluctuated from being about one-half percentage point below to more than two percentage points below the U. S. index. The increase in volatility and the lagging of the Kentucky index are evident in Figure 3, which provides a "close-up" view of the period from December, 1987, to August, 1989.

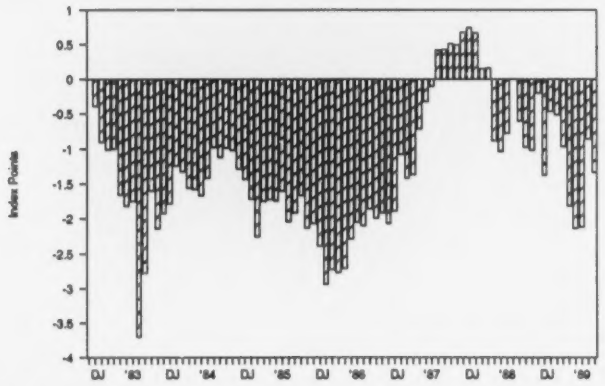
Notes

[1]At the time of writing, this was the latest month for which employment data were available.

Figure 2

Kentucky Index less U.S. Index

Nonagricultural Employment

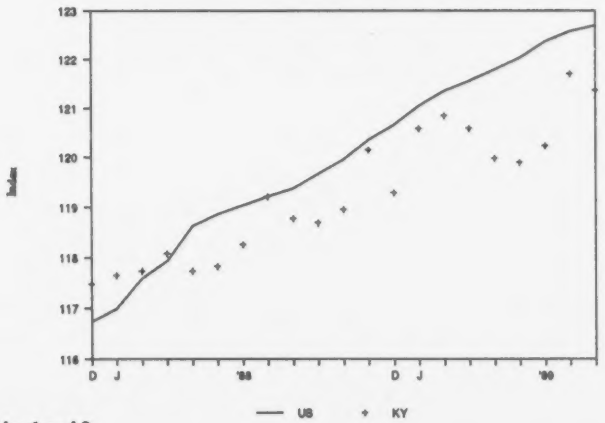


Source: Derived from Tables 1 and 2

Figure 3

Nonagricultural Employment Trends

U.S. and KY. 12/87-8/89, 11/82 = 100



Source: Derived from Tables 1 and 2

Shift-Share Analysis: Identifying the Growth Potential of Kentucky

Lynne S. Kelly

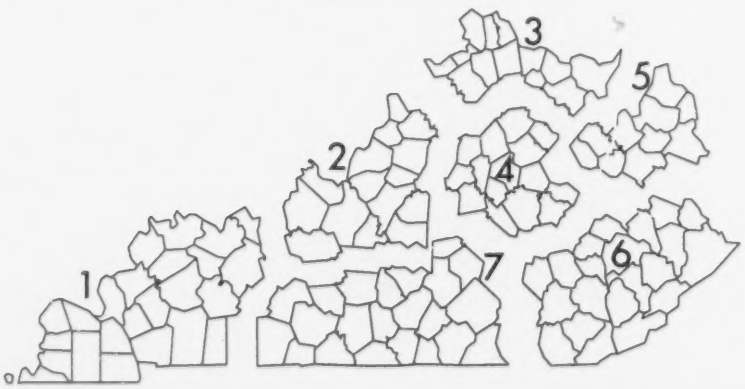
Technological forces are increasingly driving economic change in the United States. These technological forces are combining with changing demographics, particularly the declining birthrate of the 1970s. As a result, changes in the structure and composition of the American workforce are anticipated to accommodate the changing needs of employers. The Commonwealth of Kentucky has responded to this new demand by seeking to determine possible growth industries and to identify discrepancies between the new jobs skills demanded and the supply of workers entering the workforce from Vocational Education programs and Second Chance job training programs.

The Center for Business and Economic Research (CBER) at the University of Kentucky recently completed a study utilizing a variety of research techniques to identify potential growth opportunities for each of the Commonwealth's 120 counties. This project was jointly funded by the Kentucky Cabinet for Human Resources and the Kentucky Cabinet for Economic Development.[1] The impetus for the study is the Welfare Reform Act of 1989, and its requirement that welfare recipients enter a job training program by October, 1990.

The research team at CBER combined three research techniques in an effort to identify the job skills that are needed now and have potential for development in the future. The ultimate goal of the study was to provide the Cabinets for Human Resources and Economic Development with a data source for joint use in planning. For purposes of analysis, the state was divided into seven geographic areas according to

Lynne S. Kelly is Senior Research Associate at the Center for Business and Economic Research, University of Kentucky, and a member of this project's research team. This summary article is based on the results of the larger research project completed by the entire research team.

Figure 1
Kentucky, by Analysis Region



geographic and economic similarities. These regions are depicted in Figure 1.

Shift-Share Analysis

The first phase of the project involved regional shift-share and input-output analyses based on employment data. Many regional economic developers theorize that regional growth is primarily due to a region's ability to produce goods or services demanded by the nation and world economies and to export them at a competitive advantage with respect to other regions. On the basis of this theory, regional growth policy has typically been directed to those economic sectors that hold a competitive advantage with respect to other regions. Shift-share analysis "highlights" industries which appear to have a competitive advantage for future development in the region, because the industry is performing "better than expected" given the economic structure of the region and national growth trends.

Shift-share analysis provides a descriptive explanation of the change in regional economic activity over some time period by isolating the individual components of change. These components are: the national growth effect (the part of the region's employment that is attributable to changes in employment at the national level); the industry-mix effect (the part of a region's employment growth attributable to the differences between the industrial composition of a region and the nation); and the regional share or competitive effect (which reflects the impact of locational advantages that cause certain industries to grow faster or be more attracted to the region).

Changes in employment were used in this study as a measure of economic activity. Employment data were obtained from the U.S. Bureau of the Census, *County Business Patterns*, for the years 1980 to 1985, the latest year for which data were available at the county level at the time of the analysis. Because of the limitations of the data, certain employment trends that might have emerged after 1985 are not represented in this analysis, such as trends in the automotive industry after the location of the Toyota plant in Scott County. However, the methodology employed does allow for future updating and revision.

The shift-share results for the state are presented in Table 1. As the table shows, the three industry sectors most frequently highlighted throughout the state were Printing and Publishing, Transportation, and Business Services. All three are growth industries, and each of these sectors includes businesses that are service- and information-oriented. In the Transportation sector, there have been significant increases in the employment opportunities in trucking, warehousing, cargo handling, and air transportation. In the area of Printing, there has been an increase in jobs associated with various printing processes and the publication and printing of newspapers. Finally, major changes have occurred in the Business Services sector. Although this group was highlighted in two of the seven regions, significant employment increases occurred in several areas of the state. Of particular interest are the changes associated with data processing, detective agencies and protective services, management, temporary help supply agencies, consulting and public relations services, and equipment rental and leasing services.

Caution is required in the interpretation of the results. The highlighted sectors represent industries in which a specified region appears to have a competitive advantage, based on employment data. There is, however, the possibility that employment growth has occurred in this region because these sectors have been grossly underrepresented in the past. In addition, the shift-share analysis technique is designed to track historical data, and not to track the reasons for those trends. There is a possibility that certain observed shifts within the regions may not indicate future expan-

Table 1
Shift-Share Highlighted Industries in Kentucky, by Region

Industry Sector	Region 1	2	3	4	5	6	7
Printing and Publishing (SIC 27)	+		+	+	+		+
Transportation Equipment (SIC 37)	+						+
Transportation							
Motor Freight, Transportation and Warehousing (SIC 42)		+		+	+	+	
Transportation by Air (SIC 45)		+	+				
Transportation Services (SIC 47)		+	+				
Water Transportation (SIC 44)		+	+				
Primary Metals (SIC 33)		+					
Stone, Clay and Glass Products (SIC 32)		+					
Petroleum Refining (SIC 29)					+		
Business Services (SIC 73)	*	*	*	*		+	+
Food and Kindred Products and Tobacco (SIC 20)						+	
Miscellaneous Repair Services (SIC 76)						+	
Miscellaneous Manufacturing (SIC 39)							*
Communications (SIC 73)					*		

* highlighted industry (industries in which growth outpaced that in the nation)
\+ not cited as highlighted industry, but represents significant employment growth
SIC = Standard Industrial Classification, U.S. Office of Management and Budget

sion, but represent an artifact of past regional deficiencies. Other unidentified causes may also impact results, such as the condition of the general economy, government spending in certain areas, and market trends.

Input-Output Analysis

The shift-share analysis was supplemented with input-output analysis, which assesses the impact of major suppliers to the shift-share highlighted industries by analyzing purchase and sales relationships among industries. This technique focuses on the interdependence of industries. This information can be useful in predicting secondary industry expansions, occupational group impacts, and other training and educational requirements as economic development takes place. Such analysis was performed at the regional level to look at the secondary effects of economic development.

The results of the input-output analysis indicated that the principal suppliers to Publishing and Printing are paper mills, wholesale trade, commercial printing and labor. In the Transportation sector, motor freight transportation and warehousing,

petroleum refining, electric services (utilities), maintenance and repair or railroads, and water transportation all represent potential secondary industries. For Business Services, additional inputs include credit agencies and labor. All of these industries and businesses offer opportunities for expansion as a corollary of the highlighted industries.

Supplementary Surveys

The second phase of the project involved a series of surveys which were administered to community and industry leaders in order to identify the current status of employment, and current needs and future desires for local economic development. Analysis of the survey data was performed at the county level, and represents a modification of the shift-share analysis. Through survey research techniques, assessments were made of natural resources, community development interests, and perceptions of needs for future development or maintenance of the status quo. For example, in counties where no highlighted industries were revealed by economic analysis, other development options such as tourism, development of retail (based on information about local markets), and parks and entertainment facilities may be considered by planners. At the same time, survey respondents were asked questions about types of development that they do not want in their community. This information can be used by planners and economic development specialists to avoid unnecessary conflict about siting decisions. In addition, the survey assessed various infrastructure issues that could impact or alter future development patterns, by reviewing major constraints that could restrict future development. These include highways, transportation issues and social support services such as child care.

The final stage of the analysis involved identifying job skills associated with future development of the highlighted industries.

Conclusion

When results of these techniques are combined, information is provided that allows social and economic planners to evaluate current job training programs and to determine the matches between future employer needs and community perceptions.

Shift-share analysis offers a method to identify economic development at a regional level.[2] As previously mentioned, other factors may impact the results in ways that influence future development.[5] The surveys were intended to provide supplementary information about development potential. For example, many counties which do not have a variety of industrial opportunities were identified as having local interest in the development of parks and tourism, general entertainment, retail trade, and professional and nonprofessional services. Several other issues were identified by the surveys as well. Employers overwhelmingly reported a need for upgraded basic skills in the workforce in order to maintain current operations or expand.

The study offers planners and educators an opportunity to coordinate efforts in meeting the new demands for skilled workers. Economic development is a broad, complex process, and many factors will impact the future development of the Commonwealth. This study represents a step towards filling the gap between the status quo and future workforce demands.

Notes

[1]The study is available for $30 from The Center for Business and Economic Research, College of Business and Economics, University of Kentucky, Lexington, KY 40506-0047.

[2]The shift-share results for certain areas do already appear to be confirmed; for example, a printing and publishing operation recently announced the building of a new facility in Bullitt county in Region 3.

The Effects of State Lotteries on Pari-Mutuel Tax Revenues

O. David Gulley and Frank A. Scott, Jr.[1]

Lotteries have become an increasingly popular method of raising revenue for states. Thirty-one states and the District of Columbia currently have lotteries in operation. The decision of whether or not to implement a lottery usually sparks very lively debate involving various special interest groups. Proponents typically claim that a lottery will generate extra revenue without raising taxes. Among the most vocal opponents are interest groups that represent existing forms of gambling. They usually argue that a lottery will reduce betting on existing gambling opportunities, causing a reduction in the tax revenue they pay to the state. Since the tax revenues from legal non-lottery gambling are substantial, the extent (if any) to which lotteries reduce tax revenue from these other gambling forms is worthy of analysis.

Methodology

Lotteries and thoroughbred horseracing generated $4.69 billion and $422 million for states in 1986, respectively, making them the largest sources of gambling tax revenue for states.[2] If a lottery does reduce tax revenue from other gambling alternatives, it is most likely to be detected in tax revenue from thoroughbred racing. Therefore, this article will concentrate on the relationship between lotteries and thoroughbred racing.

To estimate the impact of state lotteries on pari-mutuel tax revenues, we estimate demand functions for both attendance and betting at thoroughbred race tracks. These demand functions will specify how various factors influence attendance and betting. Attendance at a race track during a year is likely to be determined by attributes of the entertainment being provided, the availability of competing forms of entertainment, weather, and economic and demographic characteristics of the market area. The entertainment value of horseracing depends on the number of races run during the year, the takeout rate (the percentage of each dollar bet not returned to bettors), and the quality of the horses (measured by using purse size.) Competing forms of entertainment most likely to influence attendance include other gambling opportunities such as a lottery, harness racing, dog racing, and jai-alai. Economic and demographic characteristics likely to influence attendance include unemployment, average per capita income, racial composition, and age distribution.

Betting behavior at horse tracks is likely to be influenced by similar factors though some differences do exist. The takeout rate will probably influence betting behavior more than the attendance decision. The unemployment rate (which is used to measure idle time) will likely influence attendance but not betting by those who attend, as long as changes in income are taken into consideration. Weather is likely to only influence attendance over the course of the season, not betting. Finally, while the existence of a lottery may reduce track attendance, it is the dollar volume spent playing the lottery that probably affects the level of betting at a horse track.

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While there are clearly differences in thoroughbred racing and lotteries, both offer gambling opportunities. In addition, it has been found that many of the same factors that influence wagering on thoroughbred racing also influence wagering on lotteries. It is of interest then to examine the degree to which wagering on lotteries influences wagering on horse racing. This has not been previously done.

The methodology used to examine this question is multiple regression analysis. This is a statistical method that allows for analysis of the effects of lotteries on attendance and betting at thoroughbred tracks while controlling for other factors that influence attendance and betting. Data from 61 thoroughbred tracks from 1976 to 1980 are used in the study.[3] Some of these tracks are in states with lotteries, and some are not. Demographic data for the track market area are also used,[4] as well as data on state lottery wagering. All dollar values are adjusted to account for effects due solely to inflation.

Results

The results of the multiple regression analysis are presented in Table 1. The purpose is to explain changes in the dependent variable. These changes are presumed to be caused by changes in the independent variables.

For this study, two separate dependent variables are used. The first is attendance per capita, which is yearly attendance at a track divided by the population of the track market area. Attendance per capita measures the intensity of attendance by area residents.[5] As shown in Table 1, a variety of independent variables influence attendance per capita. For example, the coefficient on number of races means that if there is one more race during the year, attendance per capita will increase by 0.0003 at an average track. If, for example, the population of the track market area is 10,000, then attendance will increase by 3 patrons (10,000 x 0.0003) over the course of the season at an average track if another race is added. Further, the number of races influences attendance per capita in a statistically significant way. This means that we are 95% confident that the coefficient is not zero. The other independent variables can be interpreted in a like manner. Negative signs indicate that increases in these variables cause attendance per capita to decline. The important independent variable for our purposes is the one that measures whether or not there is a lottery in the state. The negative sign on the coefficient means that the presence of a lottery reduces attendance per capita. However, this negative influence is not statistically significant. This means that we have less than 95% con-

Table 1
Multiple Regression Analysis Results

	Dependent Variables	
Independent Variables	Attendance Per Capita	Handle Per Patron
Intercept	2.625*	9.001
Number of Races	0.0003*	-0.001
Takeout Rate	0.069	-110.5*
Per Capita Income	-0.00023*	0.013*
Percent Black	0.0013	0.687*
Median Age	-0.023	0.058
Total Purses	1.14×10^{-7}*	——
Average Temperature	0.0005	——
Unemployment Rate	0.015	——
Presence of the Lottery	-0.015	——
Age of the Lottery	-0.031*	——
Presence of Other Gambling Opportunities	-1.02*	-3.042
Lottery Revenue per Capita	——	-0.18

A * indicates that we can say with 95% confidence that this number is not equal to zero. A —— indicates that this variable is not used in the particular regression. The intercept in each regression picks up the influences of other factors that are not accounted for by the independent variables in each regression.

Selected Indicators of Economic Activity

	April 1989	May 1989	June 1989	Quarter II 1989	% Change From Previous Quarter	% Change From Previous Year	April 1989	May 1989
	KENTUCKY							
EMPLOYMENT								
Civilian Labor Force (SA) (thousands)								
Total	1728.9	1724.2	1713.9	1722.3	-0.5	0.8	123659.0	123610.0
Employed	1615.0	1605.9	1604.9	1608.3	.0	2.8	117113.0	117215.0
Agriculture	65.3	70.3	74.5	70.0	6.3	10.8	3104.0	3112.0
Nonagriculture	1549.7	1535.5	1535.5	1540.3	-0.2	2.5	114009.0	114103.0
Unemployed	115.1	113.9	112.4	113.8	-7.3	-19.8	6546.0	6395.0
Civilian Unemployment Rate (SA)	6.6	6.6	6.6	6.6	*	*	5.3	5.2
Nonagricultural Wage and Salary Employment (SA) (thousands)[1]								
Total	1386.9	1386.4	1390.2	1387.8	-0.5	1.8	90475.0	90623.0
Goods-Producing	377.8	377.2	378.0	377.7	-1.2	1.7	25671.0	25672.0
Manufacturing	281.1	281.4	281.7	281.4	0.2	4.3	19672.0	19667.0
Services-Producing	1009.1	1009.1	1012.2	1010.1	-0.3	1.8	82430.0	82638.0
EARNINGS AND PRODUCTIVITY								
Average Weekly Earnings of Production Workers[2]								
Manufacturing	414.9	414.3	418.6	415.9	1.5	1.5	429.5	427.2
Mining[3]	279.7	278.6	237.4	265.3	-7.9	-36.5	564.5	551.5
Average Weekly Hours of Production Workers								
Manufacturing	40.4	40.3	40.6	40.4	0.7	-0.4	41.3	41.0
Mining	30.5	32.1	30.2	30.9	1.5	-10.1	42.8	42.0
HOUSING (Permits)[4]								
Total Units (U.S. in thousands)	1001.0	1294.0	1218.0	3513.0	31.2	1.2	133.4	134.7
Valuation (million $)	67.4	72.9	74.6	214.9	30.0	-4.6	9037.0	9814.0
Single-Family Units (U.S. in thousands)	798.0	785.0	871.0	2454.0	29.6	-8.3	89.0	94.3
Valuation (million $)	63.0	62.0	65.3	190.3	31.6	-7.3	7673.0	8161.0
Multi-Family Units (U.S. in thousands)	203.0	509.0	347.0	1059.0	34.9	33.2	44.4	40.4
Valuation (million $)	4.4	10.9	9.3	24.6	19.0	22.2	1364.0	1668.0
COAL MINING[5]								
Coal Production (million tons)								
Total	12.3	13.6	12.9	38.7	-9.6	2.2	77.5	82.8
Eastern Kentucky	9.1	10.0	9.5	28.6	-9.8	1.6	–	–
Western Kentucky	3.2	3.5	3.4	10.1	-9.1	3.8	–	–
CAR SALES								
New Passenger Car Registration (thousands)[6]	9.1	9.2	10.0	28.4	22.7	-4.7	843.1	885.1

NOTES

SA = Seasonally adjusted

SAAR = Seasonally adjusted at annual rate

* = Percent change from previous period is not meaningful.

** = Quarter to quarter comparisons are not meaningful due to seasonal variation.

% Change From Previous Year = The percent difference between the current quarter and the same quarter in the previous year.

[1]Nonagricultural Wage and Salary Employment differs from the Employed Nonagricultural Civilian Labor Force by the number of persons defined as self-employed.

[2]Average hourly earnings can be calculated by dividing average weekly hours into average weekly earnings.

[3]For Kentucky, the measures of mining productivity are only for bituminous coal and lignite. However, the U.S. data includes other forms of mining.

[4]The housing figures descri which a construction permi

[5]These mining figures desc bituminous coal and lignite the U.S.

[6]New passenger car registra R.L. Polk & Company.

These tables of selected indicators of economic activity were prepared using data maintained through the Kentucky Economic Information System, Carol M. Straus, Manager. The data in the tables are reported figures which were obtained from a variety of state and federal agencies, as well as from private firms.

June 1989	Quarter II 1989	% Change From Previous Quarter	% Change From Previous Year
UNITED STATES			
124107.0	123792.0	0.4	2.1
117541.0	117289.7	0.3	2.3
3096.0	3104.0	-4.3	-0.4
114445.0	114185.7	0.5	2.4
6561.0	6500.7	1.7	-1.7
5.3	5.2	*	*
90868.0	90655.3	0.6	3.2
25671.0	25671.3	0.0	1.6
19655.0	19664.7	0.2	1.9
82909.0	82659.0	0.8	3.4
428.5	428.4	3.1	2.6
558.1	558.0	0.8	4.0
41.0	41.1	0.0	0.0
42.8	42.5	1.5	0.1
130.8	398.9	36.9	-1.5
9871.0	28722.0	37.5	13.6
92.3	275.6	34.5	1.6
8054.0	23888.0	37.3	17.6
38.5	123.3	42.6	-7.7
1817.0	4834.0	38.5	-3.0
78.8	239.1	-2.9	5.5
--	--	--	--
--	--	--	--
949.6	2677.8	14.5	-2.1

	April 1989	May 1989	June 1989	Quarter II 1989	% Change From Previous Quarter	% Change From Previous Year
	UNITED STATES					
PRICES						
Consumer Price Indexes (1982=100)						
All Items	123.1	123.8	124.1	123.7	3.6	5.2
Food and Beverages	124.0	124.7	124.9	124.5	-4.5	6.4
Medical Care	146.8	147.5	148.5	147.6	-5.2	7.4
Energy	94.9	97.4	99.0	97.1	-0.5	9.1
Producer Price Indexes (1982=100)						
All Commodities	112.3	113.1	112.8	112.7	19.2	5.7
All Finished Goods	113.0	114.2	114.1	113.8	-3.2	6.0
Intermediate Materials	112.3	112.7	112.6	112.5	-4.7	5.7
Crude Materials	104.1	106.3	103.9	104.8	-4.8	8.0
All Construction Materials	119.2	119.6	119.4	119.4	-3.0	3.7

	Quarter II 1988	Quarter I 1989	Quarter II 1989	% Change From Previous Quarter	% Change From Previous Year
	UNITED STATES				
PERSONAL INCOME (SAAR) (billion $)	4022.4	4313.6	4399.6	7.2	9.4
FOREIGN TRADE (billion $)					
Exports	80.2	87.9	92.1	-8.7	14.9
Agriculture	9.6	10.0	10.6	-4.4	10.8
Imports	108.8	115.6	118.7	-5.9	9.0
Balance	-28.6	-27.8	-26.5	3.0	-7.2
MISCELLANEOUS					
Gross National Product (SA) (billion $)	4838.0	5113.1	5203.8	-5.4	7.6
Gross National Product (SA) (billion 1982$)	4010.7	4106.8	4134.0	-2.3	3.1
Composite Index of 11 Leading Indicators (1982=100)	142.3	145.2	145.5	-2.0	2.2
Index of Industrial Production (SA) (1977=100)	136.0	140.6	141.6	-3.2	4.1
Average Prime Rate Charged by Banks on Short-Term Business Notes	8.8	11.0	11.4	-19.8	29.6
Interest Rate on 3-month Treasury Bills	6.2	8.5	8.4	-27.3	35.5

	Quarter II 1988	Quarter I 1989	Quarter II 1989	% Change From Previous Quarter	% Change From Previous Year
	KENTUCKY				
PERSONAL INCOME (SAAR) (million $)	47542.0	50836.0	51252.0	-6.5	7.8
STATE GOVERNMENT RECEIPTS (million $)					
General Fund	827.7	837.0	878.0	**	6.1
State Road Fund	160.4	172.5	183.0	**	14.1

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fidence that the true coefficient is different from zero. However, as can be seen by the statistically significant negative coefficient on the age of the lottery, the older the lottery is, the more it reduces attendance.[6] Note also that the presence of other forms of gambling have a very strong negative influence on attendance at horse tracks.

The second dependent variable we use is total handle per patron, which is total yearly handle divided by total yearly attendance. This measures the intensity of betting by people who have chosen to attend the track. As can be seen, several factors have a statistically significant influence on handle per patron. Among these are the takeout rate, which negatively influences betting as one would expect. The important variable for our purposes is the coefficient on lottery revenue per capita. The interpretation is that if on average each person in a state with a lottery bets one additional dollar on the lottery, those who attend the track will reduce their betting by an average of 18 cents. Even though we are less than 95% confident that the 18 cent estimate is not zero, the coefficient remained virtually unchanged when other variables were introduced or removed from the regression analysis. Because of the robustness of this result, we can be fairly confident that additional play on lotteries does lead to reduced betting at thoroughbred tracks.

Conclusion

More and more states have introduced lotteries on top of existing competing forms of gambling such as horseracing. While substitution by gamblers among different games is acknowledged to occur, no previous study has quantified this substitution.

Our results indicate that an additional dollar bet per capita on the lottery reduces the average bet per patron at thoroughbred racing tracks by 18 cents. States keep about 40 percent of lottery wagers, but less than five percent of every thoroughbred racing bet. Applying these percentages to the estimated handle per capita relationship, each additional dollar per capita played on the lottery brings in 40 cents per capita of revenue for the state, while causing horseracing pari-mutuel tax revenue to fall by less than one cent per patron (0.05 x 0.18).

The bottom line is that lotteries seem to cause a significant substitution away from pari-mutuel betting. State tax revenues rise, however, because states keep a much larger percentage of lottery wagers. Of course, others suffer when pari-mutuel handle falls. Payments to horsemen via purses typically comprise five to six percent of handle, and the track itself may keep from six to nine percent of handle. Drops in pari-mutuel betting affect these parties as well as others in the vertical chain of production. Their opposition to state lotteries is therefore quite understandable. The pari-mutuel tax revenue effects of state lotteries, however, seem rather small.

Notes

[1]This article is based upon the authors' more extensive research paper that appeared in *The National Tax Journal*, March 1989.

[2]Clotfelter, C.T. and P.J. Cook. "Implicit Taxation in Lottery Finance," *National Tax Journal*, 35, 1986, pp 533-546.

[3]The reason that our study ends in 1980 is that the most appropriate data source for our purposes, *The Horseman's Benevolent and Protective Association Racing Statistics*, was discontinued in 1980.

[4]The track market area is defined to be the Standard Metropolitan Statistical Area (SMSA) in which the track is located. If the track is not in an SMSA, then the market area is the county of the track plus all contiguous counties.

[5]Because we use attendance per capita, the population of the market area cannot be used as an independent variable. Also, if a track is a big tourist draw, attendance per capita will increase. Tourist attendance is not likely to be influenced by the presence of a lottery.

[6]This effect does not continue forever, though. We believe our results reflect the fact that most of the lotteries were less than 8 years old during the time period of the study. Previous studies of state lotteries have shown that lottery play eventually starts to taper off after about 10 years.

Kentucky's General Fund Revenue Estimating Process

James R. Ramsey and James A. Street

The General Assembly of the Commonwealth of Kentucky enacts a biennial budget which allocates the state's resources (tax receipts, federal funds, agency receipts, etc.) for expenditure by program. A critical component of the budgetary process in Kentucky is the estimation of available revenues for expenditure purposes. The Office of Financial Management and Economic Analysis in the Finance and Administration Cabinet is statutorily responsible for developing the General Fund and Road Fund estimates to be used by the Governor in the preparation of the Executive Budget submitted to the General Assembly.[1]

The preliminary revenue estimate for a forthcoming biennium must be prepared by October 15 of the year preceding the start of the biennium. That is, the first revenue forecast must be prepared nine months prior to the start of the first fiscal year (FY) of the biennium and twenty-one months prior to the start of the second fiscal year of the biennium.[2] Revisions to the preliminary revenue estimate can be made in early January prior to the actual submission of the Executive Budget to the General Assembly in mid-January. However, at this point the revenue estimates become final for the next two years.[3]

There is no opportunity to revise the revenue estimates at the end of one fiscal year to adjust for economic changes or other unexpected events. Consequently, revenue estimates must be formulated well in advance of the actual collection and expenditure of funds. This required lead time makes revenue estimating in Kentucky an even more difficult science, or art, than is otherwise the case.

The purpose of this article is to describe the process used to derive the General Fund revenue forecast in Kentucky. A brief summary is presented which describes the techniques that were used to generate the FY89 estimate of the major revenue sources of the General Fund. Secondly, the actual revenue collections for FY89 are presented and compared to the original revenue forecast and to revenue receipts for FY88. An attempt is made to analyze growth within the General Fund from FY88 to FY89 in terms of both economic growth and growth that results from tax administration or other non-economic factors.

Estimating the General Fund

Three broad categories of forecasting procedures generally exist for estimating state revenues:

1) Subjective approaches--the consensus of expert opinion to forecast the future;

2) Time series methods--the statistical analysis of historical values of selected variables to forecast the future values of these variables; and,

3) Structural models--the establishment of cause and effect relationships and the use of economic and statistical analyses to forecast these relationships.

Each of these approaches has its advantages and disadvantages. For example,

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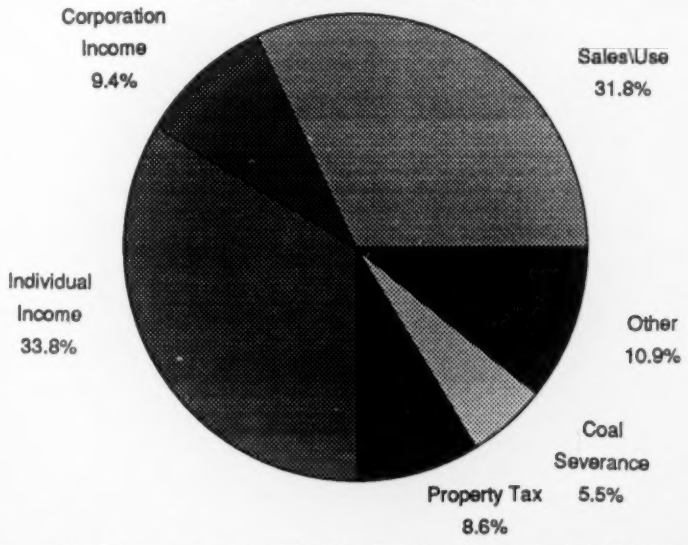
subjective approaches lack quantitative analysis or statistically valid techniques to support the revenue forecast. Structural models are costly to develop, often result in a theoretical deficiency (the over-identification problem) and have not been very accurate in the 1980s. A pure time series approach, on the other hand, lacks any underlying economic behavioral relationships.[4] As a result, pure time series models, such as the Box Jenkins, also have been deficient in forecasting revenues when structural changes have occurred in the economy; for example, the recession in the early 1980s.

Figure 1 shows the tax composition of the Kentucky General Fund in FY89. As seen, the individual income tax and sales and use tax account for nearly two-thirds of the General Fund. To estimate the individual income tax and sales tax receipts, the Office of Financial Management and Economic Analysis uses a Bayesian Vector Autoregression (BVAR) model. The Bayesian approach to statistics is a general method for combining the subjective input of the forecasters with statistically valid analytical techniques. Therefore, a BVAR model combines elements of time series models with elements of structural models.[5]

The independent variables included in our BVAR model are the historical observations of Kentucky sales tax collections and Kentucky income tax collections, and forecasted values of Kentucky non-agricultural employment, Kentucky personal income, and the consumer price index. The forecasted values of the economic variables used to generate the FY89 revenue estimates were obtained from Data Resources, Inc. (DRI).[6]

The point estimate of individual income tax collections for FY89 derived from the statistical model was adjusted to reflect: 1) the behavioral impacts of the Tax Reform Act of 1986 ($25 million); and, 2) the implementation of an accelerated individual income tax withholding collection program by the Revenue Cabinet in FY89 ($8.0 million).[7] Adjustments to the point estimate derived from the model of the sales and use tax collections for FY89 were made to reflect: 1) the normal expected

Figure 1
Composition of General Fund, FY89



Source: *Quarterly Economic and Revenue Report Annual Edition*, (Frankfort, Ky: Finance and Administration Cabinet), 1989.

audit collections for FY89 ($27.0 million); and, 2) the implementation of an accelerated sales and use tax collection program by the Revenue Cabinet in FY89 ($22.0 million).[8] The other revenues of the General Fund were estimated as described in the sections below.

Corporation Income and Corporation License Taxes. The corporation income tax has been the most volatile of all Kentucky taxes and it is the most difficult tax to model statistically. The Kentucky Equity Tax Act of 1985 and the passage of the Federal Tax Reform Act of 1986 have made the estimation of corporation and license taxes more troublesome as it is difficult to isolate these changes from economic factors. In addition, Kentucky corporate taxpayers have the ability to spread the payment of their calendar tax liability over three different fiscal years. Therefore, the timing of corporate tax payments compounds the difficulty of forecasting corporation income and license taxes.

The corporation income tax in Kentucky was forecasted to grow 6.5 percent in FY89. The average growth in Kentucky corporation tax receipts from FY77-FY85 (FY86 and FY87 were excluded because of the impacts of state and federal tax changes) was approximately 6.5 percent. DRI had forecasted corporate profits to increase approximately 5.0 percent.[9]

Property Taxes. Forecasts for the property taxes were not statistically modeled. Growth was estimated at 5.5 percent each year as determined by the evaluation trends in property assessments by Property Tax program personnel.[10]

Coal Severance Taxes. The coal severance tax was subjectively forecasted utilizing DRI and Energy Information Administration projections for oil prices, coal prices and coal demand.

All Other Taxes. The forecasts for all other taxes were based upon: 1) discussion with the individual tax administrators; and, 2) a review of the history of each individual tax.

Comparison of Actual Receipts to Estimates

Table 1 compares FY89 revenue estimates to the actual revenue collections for the year. As shown, actual FY89 revenue receipts exceeded the estimate by $13.0 million, or actual receipts were within 0.4 percent of the estimate.

To analyze real economic growth in FY89, it is useful to compare FY89 receipts with those for FY88. This is done in Table 2. As indicated, the total General Fund grew at 8.6 percent in FY89. To disaggregate this growth into non-economic and economic growth, several adjustments must be made

Table 1
General Fund Receipts, Estimated and Actual, FY 89
(million $)

Tax Type	FY 89 Estimate	FY 89 Actual	Absolute Difference	Percent Difference
Individual Income	$1,059.8	$1,111.7	$51.9	4.9%
Sales and Use	1,041.3	1,045.2	3.9	0.4
Corporation Income	308.4	310.8	2.4	0.8
Property	288.3	281.9	(6.4)	-2.2
Coal Severance	191.0	180.6	(10.4)	-5.4
All Other	388.1	359.7	(28.4)	-7.3
TOTAL	$3,276.9	$3,289.9	$13.0	0.4%

Source: *Quarterly Economic and Revenue Report Annual Edition*, (Frankfort, Ky: Finance and Administration Cabinet), 1989.

Table 2
General Fund Receipts—Actual FY88 and FY89
(million $)

Tax Type	FY 1988	FY 1989	FY 1992
Individual Income	$1,006.9	$1,111.7	10.4%
Sales and Use	951.7	1,045.2	9.8
Corporation Income	255.7	310.8	21.5
Property	269.9	281.9	4.4
Coal Severance	189.2	180.6	-4.5
All Other	356.8	359.7	.8
TOTAL	$3,030.2	$3,289.9	8.6%

Source: *Quarterly Economic and Revenue Report Annual Edition* (Frankfort, Ky: Finance and Administration Cabinet), 1989.

to identify revenue growth which resulted from administrative or program initiatives in FY89 and growth attributable to growth in the economy.

As previously noted, the tax payment acceleration program was originally estimated to increase FY89 receipts by $30.0 million; $22.0 million in the sales and use tax and $8.0 million in individual income tax withholding. The program actually produced $30.7 million in additional receipts during FY89, $22.0 million in the sales and use tax and $8.7 million in the withholding tax. [11]

In addition, approximately $61.0 million was paid by taxpayers under the new tax amnesty program. Of this amount, applications for amnesty in the amount of $1.5 million were denied for various technical reasons, leaving a net of $59.5 million. As shown in Table 3, payments of outstanding tax bills accounted for $31.3 million, amended returns accounted for $16.5 million and "new taxpayers" paid the remaining $11.7 million in amnesty payments. Of these latter two items, approximately one-half, or $30 million, could be considered non-economic growth. The most significant collections were in the individual income tax, corporation income tax, corporation license tax, sales and use tax and omitted intangible property tax. Collections in these taxes made up 94.0 percent of the tax amnesty collections. [12]

Adjusting for these two "one time" revenue programs, the General Fund grew at 6.6 percent. While the sales and use tax receipts increased to $1,045.2 million, or by

Table 3
Summary of Amnesty Collections, FY89
(million $)

Tax Type	Amended Returns	Accounts Receivable	New Taxpayers	Total
Individual Income	0.9	$4.4	$1.9	$7.2
Corporation Income	8.9	7.2	2.0	18.1
Corporation License	1.7	1.5	1.0	4.2
Sales and Use	3.5	14.7	4.3	22.5
Intangible Property	0.4	1.6	2.1	4.1
All Other	1.1	1.9	0.4	3.4
TOTAL	$16.5	$31.3	$11.7	$59.5

Source: Kentucky Revenue Cabinet

General Fund Revenue Estimates for FYs 1990-1992

On January 16, 1990, the Office of Financial Management and Economic Analysis (OFMEA) submitted the revenue estimates for fiscal years 1990-1992 to the three branches of government. These estimates are shown in Table 1.

Table 1
General Revenue Fund Estimates, FYs 1990-1992
(million $)

Tax Type	FY 1990	FY 1991	FY 1992
Total General Fund	$3,469.6	$3,645.0	$3,840.7
Individual Income	1,252.5	1,344.0	1,439.8
Sales and Use	1,072.9	1,117.3	1,173.2
Property	295.2	308.3	324.6
Corporation Income	285.2	310.9	317.2
Coal Severance	181.0	182.8	184.6
All Other	382.8	381.7	401.3

Source: *Revenue Estimates and Initiatives* (Frankfort, Ky: Finance and Administration Cabinet), 1990.

The revenue estimation process was similar to that described for FY89. However, some adjustments to the methodologies were made. During the past year, OFMEA has developed an econometric model of the Kentucky economy. This Macromodel of Kentucky (MAK) has approximately 35 equations. These equations describe the structure of the Kentucky economy. The primary objective for developing a state econometric model is to produce quarterly forecasts of major economic indicators for Kentucky. Currently, MAK can forecast labor force data, employment by industry, wage and salary by industry, and disaggregated personal income. MAK's forecast of Kentucky nonagricultural employment and Kentucky personal income replaced the DRI forecasts previously used by OFMEA in the BVAR models estimating the state's individual income tax receipts and sales and use tax receipts.

Previously, raw historical tax receipt data have been used in the BVAR estimation procedures. In an attempt to improve the accuracy of the estimates, the data were seasonalized and natural logarithms were calculated. Since the forecasts of the Kentucky economic variables used in the BVAR model are seasonalized, the procedure should result in improved model consistency.

Finally, corporation income tax receipts were modeled within the framework of MAK. A stand-alone equation was used. The equation with the best statistical fit was one that related Kentucky corporation income tax receipts to U.S. before-tax corporate profits with inventory valuation adjustments. Because of the lag involved in such a relationship, the best fit was with a three-period moving average of the national variable.

9.8 percent, the economic growth in the sales tax was also 6.6 percent. Individual income tax receipts increased in total by 10.4 percent for FY89 with economic growth of 8.3 percent. The corporation income tax showed a significant increase of 21.5 percent with receipts totalling approximately $310.8 million. However, excluding amnesty payments, regular collections grew 16.2 percent. The coal severance tax actually declined in FY89 reflecting the declines in both production and prices for Kentucky coal.

Conclusion

The General Fund revenue forecast for FY89 was extremely accurate. In addition,

Kentucky's economic growth in FY89 continued to track closely with growth in the national economy. Total revenue growth in Kentucky exceeded economic growth due to the implementation of several administrative programs to increase the state's revenue potential. While this non-economic growth resulted primarily in a one-time infusion to the General Fund, it is anticipated that as a result of the tax amnesty program, new taxpayers have been identified who will become an ongoing revenue source to the state. Kentucky's revenue outlook for FY90 looks good in terms of meeting the fiscal year estimates as both the national and state economies continue to experience steady, albeit slow, economic growth.

Notes

[1]The Office of Financial Management and Economic Analysis reflects a reorganization which combines the previous Office of Investment and Debt Management and the Office of Revenue Estimating and Economic Analysis. Currently, the reorganization is the result of an Executive Order and is subject to approval by the General Assembly.

[2]The state's fiscal year begins July 1 and ends June 30.

[3]Adjustments to the forecast can be made as a result of legislation enacted during a General or Special Session. Also, in the case of a potential revenue shortfall new revenue forecasts are generated which are the basis for mid-year expenditure adjustments.

[4]M. Keian Deravi, "Forecasting Accuracy of Alternative Techniques: A Comparison of Alabama Forecasts", *Regional Science Perspectives*, Vol. 18, No. 2, p. 94-107.

[5]Richard M. Todd, "Improving Economic Forecasting with Bayesian Vector Autoregression", *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall, 1984.

[6]See: *Revenue Estimates for the Biennium July 1, 1988 - June 30, 1990* (Frankfort, Ky: Finance and Administration Cabinet, 1988).

[7]See: *Impact of the Tax Reform Act of 1986 on Kentucky Income Tax Liability and Receipts* (Washington, D.C.: Policy Economics Group, 1989).

[8]*Revenue Estimate for the Biennium July 1, 1988 - June 30, 1990.*

[9]Ibid.

[10]Property taxes include real property, tangible property and intangible property.

[11]*Quarterly Economic and Revenue Report Annual Edition* (Frankfort, Ky: Finance and Administration Cabinet), 1989.

[12]Ibid.

[13]Ibid.

INFORUM

The following books, reports and reference sources may be of interest to those working in the social science areas of public policy, economics and economic development. For this issue, we will focus on information concerning economic development and job training:

Where the Jobs Are: Identification and Analysis of Local Employment Opportunities by William McKee and Richard Froeschle describes a systematic approach to local labor market analysis, human resource planning and employment training programs. The book was published by the W.E. Upjohn Institute for Employment Research in 1985. *Where the Jobs Are* leads the reader through the analytical process of understanding the dynamics of local labor market opportunities and identifying job opportunities in local communities. It focuses particular attention on job openings that are expected to occur through worker replacement, which is often overlooked or underestimated by those looking for "high growth" jobs.

Lewis J. Perelmen, a consultant on policy and strategic management, has written a report entitled *The Learning Enterprise: Adult Learning, Human Capital and Development.* Published in 1984 by the Council of State Planning Agencies, the monograph urges educators and policy makers to focus attention on adult learning, by concentrating on the processes of learning and the needs of the learning consumer. The author expresses concern for the costs as well as the benefits of training, and visualizes learnin as a competitive industry. This viewpoint leads to a reconsideration of current government policies and approaches to education.

In *Resources for Economic Development,* the Kentucky Department of Economic Development, Division of Research and Planning, offers profiles of each of Kentucky's 120 counties. These booklets are published in three year cycles, with the cooperation of the local Chambers of Commerce and municipal governments. These publications are ideal for information users interested in impacting siting decisions, and offer detailed basic information about labor markets, infrastructure, existing industry, transportation, utilities and public services, education and governmental structure.

A Second Chance: Training for Jobs, Sar Levitan, Director of the Center for Social Policy Studies at The George Washington University, and Frank Gallo examine the federally-funded activities under the Job Training Partnership Act (JTPA), first funded in 1983. The authors analyze the major components of the legislation, which expanded the administrative authority of the states and business community. The training programs rely on classroom, on-the-job and job-search training, but the authors argue that inadequate federal funding and supervision, and the implementation of performance standards have created pressures for administrators to exclude those who need help the most. Published by the W. E. Upjohn Institute of Kalamazoo, Michigan in 1988, this book offers the most comprehensive explanation of the features and functions of JTPA to date, and is of interest to those concerned with education, job training and economic development.

News & Notes

Effective November 15, 1989, Senior Associate Dean of the College of Business and Economics, and member of the Advisory Board for the Center for Business and Economic Research, Meri M. Hackbart was appointed State Budget Director. Dr. Hackbart is responsible for directing the development of the executive budget and as well as oversight of its execution pending legislative approval.

In August of 1989, Lucinda Zoe resigned her position as Assistant Director/Information Specialist, of the Center for Business and Economic Research in order to enter the doctoral program in Library Science at Columbia University of New York. Dan Jacovitch has replaced Ms. Zoe as Information Specialist at the Center. Mr. Jacovitch was previously associated with Jerrico in Lexington.

The Research and Policy Committee of the Committee for Economic Development published a handbook for statewide strategic economic planning in 1986. In *Leadership for Dynamic State Economies*, the Committee offers guidelines and strategic planning information for states interested in economic development. The authors offer suggestions for state planners to use regulatory and adjudicative powers to form necessary partnerships with business, educators, and various state agencies to promote the implementation of long-term economic development goals.

The Southern Policies Growth Board publishes a monthly newsletter which offers policymakers information and recommendations for economic development in the south. Issues typically contain a paper on a topic of interest to decision-makers, and a listing of member organizations. Topics presented in the most recent issues included linkages between educational institutions and the private sector, technology transfer between academia and the private sector, and education, job training and labor force issues. The Southern Policies Growth Board is a public interstate agency governed and supported by state and local governments, higher institutions of learning, and colleges and universities.

The Northeast-Midwest Institute published a useful *Guide to State and Federal Resources* in 1988. Edited by Charles Bertsch, this handbook is aimed at identifying the most important elements of economic change, and devising a strategy to keep and attract investments and jobs. The *Guide* is designed as a handbook of basic information for promotion of economic development at the state and local level. This edition stresses state economic development programs in all 50 states. It contains more than 50 case studies and reports on 400 other state devised efforts. The book is valuable for planners and state officials as they meet the challenge of providing greater services in an era of declining federal resources.

—— Lynne Kelly
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Subsidized Child Care and the Labor Supply of Low-Income Kentuckians[1]

Mark C. Berger and Gail A. Mitchell

This is a time of rapid socioeconomic transition and progress, yet progress only occurs as the obstacles which hinder change are removed. In today's service-oriented economy, one such transition is the increased labor force participation of females, many of whom are also low-income single parents. These women are faced with the problem of finding adequate day care arrangements in order to work. Unfortunately, some of these women often find that child care costs require such a large portion of their earnings that they are compelled to stop working, and are thus forced to rely on government welfare programs. Also, the high cost of child care limits the quality of care some women can afford for their children. Policymakers will have to confront the issue of child care costs if they wish to increase the participation of low-income females in the labor force. Alleviating these costs may increase the economic self-sufficiency of these women and assist them in providing a better day care environment for their children. Many advocate the expansion of day care subsidy programs to address this problem.

This paper presents new data that allow an assessment of the effects of subsidized child care on labor supply. The data collected for this study are innovative in several respects. While previous data exist for other states, these data are specific to Kentucky. Also, there is little, if any, previous data that permit a joint analysis of child care subsidies and labor supply responses of working mothers. The majority of past evidence stresses the experiences of married women, while our data consist overwhelmingly of the experiences of low-income, single mothers, for whom the child care dilemma is most problematic. Policymakers should find these data useful as they contemplate expansion of existing day care subsidy programs and introduction of new subsidy programs.

Data

The data were obtained via telephone survey from individuals in both the

Mark C. Berger is Professor and Gail A. Mitchell is a graduate student in the Department of Economics, University of Kentucky.

Community Coordinated Child Care (4C) day care subsidy program in Louisville, and the Title XX Purchase of Care (POC) subsidy program across the state. For comparison purposes, individuals on waiting lists for these programs and a sample of individuals on Aid to Families With Dependent Children (AFDC) were also surveyed.

Survey respondents were asked about themselves, their family, and their current and past employment and day care arrangements. Also, hypothetical questions were posed to subsidy recipients concerning how they would behave if they lost their subsidy and to individuals on waiting lists about how they would change their labor supply and day care arrangements if they were to gain a subsidy.

The surveys are very useful in that they allow for three types of comparisons to be made: (1) actual differences in labor supply and day care arrangements before and after receiving a subsidy; (2) actual differences in the labor supply and day care arrangements between those receiving a subsidy and those on the waiting list; and (3) hypothetical changes in labor supply and day care arrangements that would occur if a group received or lost a subsidy. The unique design of the surveys offers some of the most detailed information currently available on families receiving day care subsidies and their labor supply decisions.

The 4C and POC subsidy programs serve low-income families in Kentucky, most of whom are headed by single females. Specifically, the 4C program provides subsidies of up to $50 per week per child to families in Louisville with incomes of not more than 80 percent of the median family income in Kentucky. In order to be eligible for this subsidy, the family head must be working at least twenty hours per week or attending school on a full-time basis when the survey was conducted. At the time of the survey in July 1989, 118 families were receiving a 4C subsidy and approximately 470 families were on the waiting list. Seventy 4C recipient families and 77 4C waiting list families participated in our telephone survey.

The POC program provided child care subsidies to 1455 Kentucky families in our 31 county sample area with approximately 620 families on the waiting list in August 1989.[2] Participation is limited to families earning less than 60 percent of the state family median income, and the program pays up to $40 per week in child care costs. The POC sample consists of 130 participants and 250 waiting list families.

Results

In this section we investigate whether day care subsidies increase employment, affect hours worked and wages, and reduce AFDC payments. We also consider how subsidies affect the type of child care chosen. These questions are examined by comparing the responses of those on waiting lists and those receiving subsidies, and by looking at actual and hypothetical differences in behavior over time. Table 1 provides an overview of the average characteristics of individuals across the five surveys.

The survey results suggest that day care subsidies increase the probability of a parent working. This is not surprising since economic theory suggests that subsidies help defray some of the fixed costs associated with working for parents with children. In addition, most subsidies have a minimum work requirement. Table 1 shows that those with subsidies have employment rates that exceed those on waiting lists by approximately 17.0 percent for the 4C and POC programs. Table 2 shows employment rates of those receiving POC subsidies increased from 88.1 percent to 96.2 percent after receiving a subsidy.

Table 1
Average Characteristics of Individuals Surveyed

Variable	4C Recipients	4C Waiting List	POC Recipients	POC Waiting List	AFDC Recipients
# Surveyed	77	70	130	250	69
Years of Schooling	12.8	12.5	12.4	12.3	11.3
% Completed High School	50.6	65.7	71.5	71.8	75.0
Percent Completed College	2.6	5.7	3.8	1.2	4.4
Percent Black	53.2	42.8	50.8	40.2	31.9
Percent Female	97.4	95.7	100.0	98.4	100.0
Percent Married	6.5	24.2	5.4	19.7	20.3
Annual Family Income	$12,417	$13,427	$11,440	$12,271	$10,042
Percent Working	98.7	81.4	96.2	79.5	21.7
Hourly Wage	$5.45	$5.51	$5.05	$4.93	$6.11
Hours Worked Per Week	37.8	37.4	36.2	35.4	35.3
# Children in Day Care	1.52	1.58	1.46	1.54	1.50
Daily Cost Per Child	$3.82	$6.14	$2.00	$5.80	$3.12
Daily Subsidy Per Child	$5.19	$0.00	$6.57	$0.00	$0.00
Day Care Distance (minutes)	10.2	9.5	8.6	9.0	3.1
Day Care Child/Staff Ratio	5.30	4.87	5.25	4.91	4.90
Percent Using Centers[a]	100.0	40.4	100.0	38.6	14.3
Percent Satisfied with Current Day Care	85.7	64.9	92.7	66.2	91.7
Percent Receiving AFDC	1.3	7.1	6.2	14.4	94.2
Percent Ever Received AFDC	-	-	56.2	55.0	100.0

[a]Includes Type I and II Licensed Providers

Hypothetical changes in employment resulting from day care subsidies are also found in Table 2. Employment rates would decrease by 26.7 to 26.8 percent when those currently receiving subsidies were asked whether or not they would work if confronted with a situation in which their subsidy were no longer available. Those on the waiting lists were asked if they would work if they received a subsidy. For the 4C and POC waiting list groups, employment rates would increase by 17.1 to 19.3 percent respectively. When considering all of the estimates, we find that a 15 to 20 percent employment effect is associated with the implementation of day care subsidies. This means that for one in every five or six parents in these low-income populations, day care subsidies are the difference between working and not working.

The surveys suggest that day care subsidies increase hours worked by the parent receiving the subsidy. Table 2 shows actual changes in hours worked after receiving a subsidy as well as hypothetical changes in hours worked after receiving or losing a subsidy. The average increase for POC recipients is 4.28 hours per week. In fact 86.6 percent of POC recipients worked as many or more hours after receiving a subsidy. Among 4C recipients, 80.5 percent worked the same or more hours after receiving a subsidy. For those on waiting lists, a hypothetical subsidy would result in an average increase of 9.36 hours worked per week for the POC program and a 7.44 hours per week increase for the 4C program. Similarly, POC recipients report that they would decrease hours per week by 8.48 if they lost their subsidy, while 4C recipients report

Selected Indicators of Economic Activity

	July 1989	August 1989	September 1989	Quarter III 1989	% Change From Previous Quarter	% Change From Previous Year	July 1989	Au 1
	KENTUCKY							
EMPLOYMENT								
Civilian Labor Force (SA) (thousands)								
Total	1,726.3	1,734.6	1,738.7	1,733.2	0.6	0.9	123,956.0	124
Employed	1,616.9	1,622.2	1,622.7	1,620.6	0.8	2.5	117,459.0	117
Agriculture	75.1	73.9	73.4	74.2	5.1	5.2	3,219.0	3
Nonagriculture	1,541.8	1,548.3	1,549.3	1,546.5	0.6	2.4	114,240.0	114
Unemployed	107.5	107.6	110.1	108.4	-4.9	-19.8	6,497.0	6
Civilian Unemployment Rate (SA)	6.2	6.2	6.3	6.2	*	*	5.2	
Nonagricultural Wage and Salary Employment (SA) (thousands)[1]								
Total	1,401.5	1,401.5	1,397.2	1,400.0	0.8	1.9	108,767.0	108
Goods-Producing	374.8	373.4	368.2	372.1	-0.3	0.8	25,669.0	25
Manufacturing	283.2	281.3	276.4	280.3	-0.5	1.6	19,649.0	19
Services-Producing	1,026.7	1,028.1	1,029.0	1,027.9	1.2	2.4	83,098.0	89
EARNINGS AND PRODUCTIVITY								
Average Weekly Earnings of Production Workers[2]								
Manufacturing	405.3	408.3	402.9	405.5	-2.5	-1.5	424.0	
Mining[3]	193.6	265.0	238.9	232.5	-12.4	-52.2	550.4	
Average Weekly Hours of Production Workers								
Manufacturing	39.2	39.6	39.5	39.4	-2.5	-2.5	40.5	
Mining	25.3	36.0	33.6	31.6	2.3	-9.5	42.5	
HOUSING (Permits)[4]								
Total Units (U.S. in thousands)	1,424.0	1,763.0	1,199.0	4,386.0	24.9	11.8	108.8	
Valuation (million $)	75.6	99.1	68.0	242.7	12.9	7.7	8,228.0	9
Single-Family Units (U.S. in thousands)	750.0	928.0	717.0	2,395.0	-2.4	0.3	79.3	
Valuation (million $)	58.2	74.4	57.0	189.6	-0.4	5.1	6,981.0	7
Multi-Family Units (U.S. in thousands)	674.0	835.0	482.0	1,991.0	88.0	29.7	29.5	
Valuation (million $)	17.4	24.7	11.0	53.1	115.9	18.0	1,247.0	1
COAL MINING[5]								
Coal Production (million tons)								
Total	9.8	14.4	13.6	37.8	-2.3	-6.7	65.1	
Eastern Kentucky	7.3	10.7	9.9	27.9	-2.4	-5.1	--	
Western Kentucky	2.5	3.7	3.7	9.9	-2.0	-10.8	--	
CAR SALES								
New Passenger Car Registration (thousands)[6]	8.7	10.4	10.0	29.0	2.1	0.7	830.3	

NOTES

SA = Seasonally adjusted

SAAR = Seasonally adjusted at annual rate

* = Percent change from previous period is not meaningful.

** = Quarter to quarter comparisons are not meaningful due to seasonal variation.

% Change From Previous Year = The percent difference between the current quarter and the same quarter in the previous year.

[1]Nonagricultural Wage and Salary Employment differs from the Employed Nonagricultural Civilian Labor Force by the number of persons defined as self-employed.

[2]Average hourly earnings can be calculated by dividing average weekly hours into average weekly earnings.

[3]For Kentucky, the measures of mining productivity are only for bituminous coal and lignite. However, the U.S. data includes other forms of mining.

[4]The housing figures descri which a construction permi

[5]These mining figures desc bituminous coal and lignite the U.S.

[6]New passenger car registra R.L. Polk & Company.

These tables of selected indicators of economic activity were prepared using data maintained through the Kentucky Economic Information System, Carol M. Straus, Manager. The data in the tables are reported figures which were obtained from a variety of state and federal agencies, as well as from private firms.

September 1989	Quarter III 1989	% Change From Previous Quarter	% Change From Previous Year
UNITED STATES			
124,040.0	124,005.0	0.2	1.7
117,456.0	117,504.0	0.2	2.0
3,257.0	3,261.0	5.1	4.3
114,199.0	114,243.0	0.1	1.9
6,584.0	6,501.0	0.0	-2.7
5.3	5.2	*	*
109,088.0	108,914.0	0.5	2.8
25,607.0	25,656.7	0.0	1.4
19,556.0	19,616.3	-0.2	0.9
83,481.0	85,257.3	3.1	5.7
434.7	428.2	0.2	2.6
578.2	564.9	1.4	5.0
41.2	40.8	-0.5	-0.5
43.9	43.2	1.6	2.4
112.1	346.2	-11.4	-9.7
8,115.0	25,605.0	-10.9	-2.5
78.7	247.1	-10.3	-7.9
6,784.0	21,536.0	-9.8	-1.1
33.4	99.1	-14.1	-13.9
1,331.0	4,069.0	-15.8	-9.2
83.4	237.9	-0.5	-4.5
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956.5	2,666.4	-0.4	-2.6

	July 1989	August 1989	September 1989	Quarter III 1989	% Change From Previous Quarter	% Change From Previous Year
	UNITED STATES					
PRICES						
Consumer Price Indexes (1982=100)						
All Items	124.4	124.6	125.0	124.7	0.8	4.7
Food and Beverages	125.4	125.6	125.9	125.6	0.9	5.2
Medical Care	149.7	150.7	151.7	150.7	2.1	7.7
Energy	98.5	97.0	95.9	97.1	0.0	5.7
Producer Price Indexes (1982=100)						
All Commodities	112.7	112.0	112.3	112.3	-0.4	4.0
All Finished Goods	114.0	113.3	113.5	113.6	-0.2	4.6
Intermediate Materials	112.6	112.1	112.4	112.4	-0.2	3.7
Crude Materials	103.7	101.0	102.0	102.2	-2.6	5.4
All Construction Materials	119.6	119.1	119.9	119.5	0.0	2.9

	Quarter I 1989	Quarter II 1989	Quarter III 1989	% Change From Previous Quarter	% Change From Previous Year
	UNITED STATES				
PERSONAL INCOME (SAAR) (billion $)	4,317.8	4,400.3	4,457.5	1.3	8.8
FOREIGN TRADE (billion $)					
Exports	87.9	92.5	92.2	-0.3	12.9
Agriculture	10.0	10.6	10.1	-4.7	-1.0
Imports	115.6	118.9	118.5	-0.3	8.3
Balance	-27.8	-26.4	-26.3	0.4	5.4
MISCELLANEOUS					
Gross National Product (SA) (billion $)	5,113.1	5,201.7	5,278.9	1.5	7.1
Gross National Product (SA) (billion 1982$)	4,106.8	4,132.5	4,160.2	0.7	2.9
Composite Index of 11 Leading Indicators (1982=100)	145.4	144.7	144.6	-0.1	0.7
Index of Industrial Production (SA) (1977=100)	140.7	141.8	142.2	0.3	2.7
Average Prime Rate Charged by Banks on Short-Term Business Notes	11.0	11.4	10.7	-6.1	10.3
Interest Rate on 3-month Treasury Bills	8.5	8.4	7.9	-6.0	12.9

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	Quarter I 1989	Quarter II 1989	Quarter III 1989	% Change From Previous Quarter	% Change From Previous Year
	KENTUCKY				
PERSONAL INCOME (SAAR) (million $)	50,811.0	51,449.0	52,007.0	1.1	7.7
STATE GOVERNMENT RECEIPTS (million $)					
General Fund	837.0	878.2	793.8	**	10.1
State Road Fund	182.9	199.0	193.0	**	8.4

Table 2
Child Care Subsidies, Employment and Hours Worked Per Week

Actual Behavior	4C Recipients	4C Waiting List	POC Recipients	POC Waiting List
Percent Employed Before Subsidy	-	-	88.1	-
Percent Employed While on Subsidy	98.7	-	96.2	-
Percent Change in Employment	-	-	8.1	-
Change in Hours After Subsidy	-	-	4.28	-
Percent Working Same or More Hours After Subsidy	80.5	-	86.6	-
Hypothetical Behavior				
Percent Employed Currently	98.7	81.4	96.2	79.5
Percent Employed if Lost Subsidy	72.0	-	69.4	-
Percent Employed if Obtained Subsidy	-	98.5	-	98.8
Percent Change in Employment	-26.7	17.1	-26.8	19.3
Change in Hours if Get Subsidy	-	7.44	-	9.36
Change in Hours if Lose Subsidy	-7.61	-	-8.48	-

an average drop of 7.61 hours. This indicates that there is a positive hours worked effect associated with day care subsidies.

Table 1 presents evidence concerning the effect of day care subsidies on wages. The 4C subsidy recipients and those on the waiting list earn almost identical wages as do POC subsidy recipients and those on the waiting list. This evidence suggests that there is little if any effect of day care subsidies on wages. Another interesting result is that day care subsidies are associated with lower AFDC payments. As shown in Table 1, only 6.2 percent of the POC recipients are also receiving AFDC benefits, while 14.4 percent of the POC waiting list individuals receive AFDC.

In addition to the labor supply effects of day care subsidies, it is important to consider the effects of a subsidy on the characteristics of the day care parents are able to obtain for their children. Our results show that subsidy recipients obtain more expensive, higher quality day care, but pay a smaller share of the cost themselves. Figure 1 provides details on the daily cost of day care to parents. In the 4C program, the average total daily day care cost per child is $9.01, with the parent paying $3.82 and the subsidy paying $5.19. People on the 4C waiting list have an average daily

child care cost of $6.14 per child, all of which they pay themselves since they receive no subsidy. The same situation exists for recipients of POC subsidies. They pay $2.00 per day per child and obtain care that costs $6.57, while those on the POC waiting list receive child care at an average daily cost of $5.80 per child, all of which they pay themselves. This lower cost to recipient families leads to more labor force participation and hours worked.

However, the full cost of day care of recipients is greater than it is for families on the waiting list. Are the children of subsidy recipients receiving better day care than the children of waiting list families? One way to answer this difficult question is to compare the characteristics of the day care before and after receiving a subsidy. This is done in Table 3. Those receiving a subsidy must use licensed day care facilities, which tend to be more costly than informal care arrangements. Before obtaining subsidies, only 33.3 percent of 4C families and 60.7 percent of POC families were placing their children in centers. Licensed centers must meet various standards of care to remain licensed, and many believe they provide higher quality care than informal care arrangements. If so, this is one way day care subsidies contribute to higher quality day care. However, 26.3 percent of 4C recipients and 20.3 percent of POC recipients would rather use non-center day care if the subsidy program permitted. This suggests that centers are not the preferred mode of care for all subsidy recipients.

Other characteristics of care change after individuals receive child care subsidies. Table 3 shows recipients choose child care that is more expensive but closer to home. For over 90 percent of subsidy recipients, the hours, meals and physical surroundings were the same or better after they received a child care subsidy. These objective measures suggest subsidies lead to better child care arrangements.

Perhaps the best way to measure improvements in child care arrangements that result from subsidies is to ask the parent if they are satisfied with their child care situation. Table 1 shows that 85.7 and 92.7 percent of 4C and POC subsidy recipients, respectively, are satisfied with their current day care arrangement, while only 64.9 and

Figure 1. Daily Day Care Cost per Child

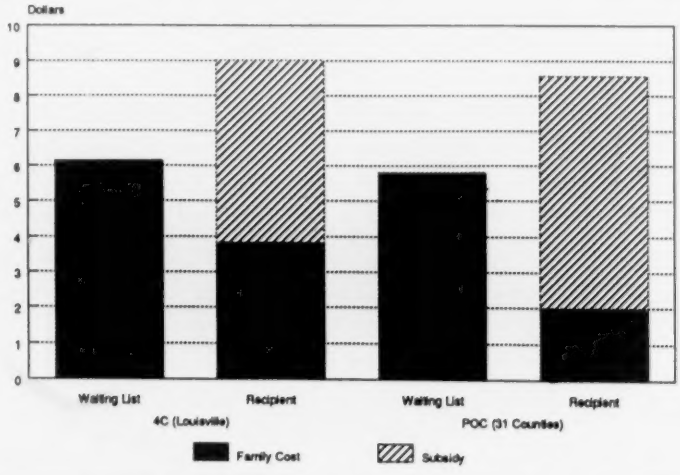

Table 3
Child Care Subsidies and the Characteristics of Care Chosen

Actual Behavior	4C Recipients	POC Recipients
Percent in Centers Before Subsidy	33.3	60.7
Percent in Centers After Subsidy[a]	100.0	100.0
Distance to Day Care Before Subsidy (minutes)	11.9	10.2
Distance to Day Care After Subsidy (minutes)	10.2	8.6
Full Day Care Cost Before Subsidy	$4.48	$3.33
Full Day Care Cost After Subsidy	$9.01	$8.57
Day Care Physical Surroundings Same or Better After Subsidy	93.8	98.2
Day Care Meals Same or Better After Subsidy	96.8	94.3
Day Care Hours Same or Better After Subsidy	90.6	92.7

[a]Includes Type I and II Licensed Providers

66.2 percent of waiting list individuals are satisfied with their current arrangements. Obviously those receiving subsidies are more content with their child care situation, and if satisfaction is related to quality of care, then those receiving subsidies are receiving higher quality child care.

Conclusion

Child care is an issue of growing concern; although there has been some research in this area, little has been done to directly evaluate the labor supply effects of child care subsidies. The new survey data presented here allows for such an evaluation. This study found that child care subsidies increase employment and hours worked, and lead to better child care arrangements. These results imply that day care subsidies can potentially increase the economic self-sufficiency of low-income women and at the same time improve the quality of day care for their children. The data presented here can be a valuable tool for policymakers in Kentucky as they grapple with child care issues. Other states as well as the federal government may want to collect similar data to help decide whether to expand and how to structure day care subsidy programs.

Footnotes

[1]This article is based upon the final report of a research project funded by the Kentucky Cabinet of Human Resources. The final report, entitled "Effects of Subsidized Child Care on Labor Supply in Kentucky," which was coauthored by Mark C. Berger, Dan A. Black, Glenn C. Blomquist, and Roger Calantone, is available from the Center for Business and Economic Research, University of Kentucky. The cooperation of the Kentucky Cabinet of Human Resources and Community Coordinated Child Care of Louisville in obtaining the data used in this study is gratefully acknowledged.

[2] The counties included in the survey are: Barren, Bell, Boyd, Boyle, Bullitt, Campbell, Christian, Clark, Daviess, Fayette, Floyd, Franklin, Graves, Hardin, Harlan, Henderson, Hopkins, Jefferson, Kenton, Logan, McCracken, Mason, Menifee, Morgan, Nelson, Perry, Pike, Pulaski, Rowan, Warren, and Whitley.